



South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

December 10, 1997

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10CFR50.73

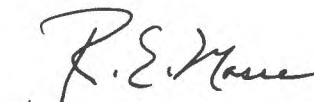
STI: 30489212

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

South Texas Project
Unit 1
Docket No. STN 50-498
Licensee Event Report 97-012
Reactor Trip Due to
Over Temperature/Delta Temperature Actuation

Pursuant to 10CFR50.73, South Texas Project submits the attached Unit 1 Licensee Event Report 97-012 regarding a reactor trip due to overtemperature/delta temperature actuation. This event did not have an adverse effect on the health and safety of the public.

The corrective actions listed in the attachment are the only commitments in this report. If you should have any questions on this matter, please contact Mr. S. M. Head at (512) 972-7136 or me at (512) 972-7800.


for G. L. Parkey
Plant Manager,
Unit 1

IE22/

KJT/kjt

Attachment: LER 97-012 (South Texas, Unit 1)

9712160385 971210
PDR ADOCK 05000498
S PDR



STI: 30489212

Ellis W. Merschoff
Regional Administrator, Region IV
U. S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-8064

Thomas W. Alexion
Project Manager, Mail Code 13H3
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

David P. Loveless
Sr. Resident Inspector
c/o U. S. Nuclear Regulatory Comm.
P. O. Box 910
Bay City, TX 77404-0910

J. R. Newman, Esquire
Morgan, Lewis & Bockius
1800 M Street, N.W.
Washington, DC 20036-5869

M. T. Hardt/W. C. Gunst
City Public Service
P. O. Box 1771
San Antonio, TX 78296

J. C. Lanier/A. Ramirez
City of Austin
Electric Utility Department
721 Barton Springs Road
Austin, TX 78704

Jon C. Wood
Matthews & Branscomb
One Alamo Center
106 S. St. Mary's Street, Suite 700
San Antonio, TX 78205-3692

Institute of Nuclear Power
Operations - Records Center
700 Galleria Parkway
Atlanta, GA 30339-5957

Richard A. Ratliff
Bureau of Radiation Control
Texas Department of Health
1100 West 49th Street
Austin, TX 78756-3189

C. R. Crisp/R. L. Balcom
Houston Lighting & Power Co.
P. O. Box 1700
Houston, TX 77251

Central Power and Light Company
ATTN: G. E. Vaughn/C. A. Johnson
P. O. Box 289, Mail Code: N5012
Wadsworth, TX 77483

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

CATEGORY 1

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:9712160385 DOC.DATE: 97/12/10 NOTARIZED: NO DOCKET #
FACIL:STN-50-498 South Texas Project, Unit 1, Houston Light & P 05000498
AUTH.NAME AUTHOR AFFILIATION
PARKEY,G.L. Houston Lighting & Power Co.
RECIP.NAME RECIPIENT AFFILIATION
Document Control Branch (Document Control Desk)

SUBJECT: Forwards LER 97-012-00, re reactor trip due to
overttemperature/delta temperature actuation.

DISTRIBUTION CODE: IE22T COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 2 + 4
TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

NOTES: Standardized plant.

05000498

	RECIPIENT ID CODE/NAME	COPIES LTTR ENCL	RECIPIENT ID CODE/NAME	COPIES LTTR ENCL
	PD4-1 PD	1 1	ALEXION, T	1 1
INTERNAL:	ACRS	16 16	AEOD/SPD/RAB	2 2
	AEOD/SPD/RRAB	1 1	FILE CENTER	1 1
	NRR/DE/ECGB	1 1	NRR/DE/EELB	1 1
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	NRR/DRCH/HICB	1 1	NRR/DRCH/HOLB	1 1
	NRR/DRCH/HQMB	1 1	NRR/DRPM/PECB	1 1
	NRR/DSSA/SPLB	1 1	NRR/DSSA/SRXB	1 1
	RES/DET/EIB	1 1	RGN4 FILE 01	1 1
EXTERNAL:	L ST LOBBY WARD	1 1	LITCO BRYCE, J H	1 1
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1128

NRC FORM 366 (4-95)				U.S. NUCLEAR REGULATORY COMMISSION APPROVED BY OMB NO. 3150-0104 EXPIRES 04/30/98 ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT								
LICENSEE EVENT REPORT (LER) (See reverse for required number of digits/characters for each block)												
FACILITY NAME (1) South Texas, Unit 1				DOCKET NUMBER (2) 05000 498		PAGE (3) 1 OF 4						
TITLE (4) Reactor trip due to overtemperature/delta temperature actuation.												
EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)			
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME		DOCKET NUMBER	
11	10	97	97	-- 012	-- 00	12	10	97	FACILITY NAME		DOCKET NUMBER	
										05000		
										05000		
OPERATING MODE (9)		1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)									
POWER LEVEL (10)		100	20.2201(b)			20.2203(a)(2)(v)			50.73(a)(2)(i)		50.73(a)(2)(viii)	
POWER LEVEL (10)		100	20.2203(a)(1)			20.2203(a)(3)(i)			50.73(a)(2)(ii)		50.73(a)(2)(x)	
POWER LEVEL (10)		100	20.2203(a)(2)(i)			20.2203(a)(3)(ii)			50.73(a)(2)(iii)		73.71	
POWER LEVEL (10)		100	20.2203(a)(2)(ii)			20.2203(a)(4)			X 50.73(a)(2)(iv)		OTHER	
POWER LEVEL (10)		100	20.2203(a)(2)(iii)			50.36(c)(1)			50.73(a)(2)(v)		Specify in Abstract below or in NRC Form 368A	
POWER LEVEL (10)		100	20.2203(a)(2)(iv)			50.36(c)(2)			50.73(a)(2)(vii)			
LICENSEE CONTACT FOR THIS LER (12)												
NAME Scott M. Head -Licensing Supervisor								TELEPHONE NUMBER (Include Area Code) (512) 972-7136				
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)												
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS			CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	
B	TG	RLY	W120	N								
SUPPLEMENTAL REPORT EXPECTED (14)								EXPECTED SUBMISSION DATE (15)		MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).				X	NO			EXPECTED SUBMISSION DATE (15)				
ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)												
<p>On November 10, 1997, Unit 1 was in Mode 1 at 100% power. At approximately 1701 hours, an Overspeed Protection Control solenoid for the Unit 1 Main Turbine momentarily energized resulting in the closing and opening of the Main Turbine governor valves. This valve response was followed by a secondary system transient and oscillating Steam Generator levels. The oscillating Steam Generator levels resulted in main feedwater flow oscillation and deviations between steam flow and feedwater flow. The secondary system transient was reflected in the primary system as an increase in average Reactor Coolant System temperature. An automatic Reactor trip occurred on two of four Over Temperature/Delta Temperature signals to the Solid State Protection System. A Main Turbine trip followed the Reactor trip. All control rods fully inserted. The Engineered Safeguards Features System actuated the Auxiliary Feedwater System and Feedwater Isolation as expected for a reactor trip. During the response to the Reactor trip, the Engineered Safeguards Features System actuated the Auxiliary Feedwater System during the transition of Main Steam Dump system modes when Steam Generator levels momentarily dropped below the LOW-LOW level setpoint. The cause of the Reactor trip was the momentary energization of the Overspeed Protection Control solenoid due to failure of a solid state relay in the control circuitry. It was determined that the solid state relay was redundant and not required for the Overspeed Protection Control circuit to perform its function. Corrective actions included removal of the redundant solid state relay from both the Unit 1 and 2 Main Turbine Overspeed Protection Control circuits.</p>												

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	IDENTIFICATION NUMBER (6)			PAGE (3)
South Texas, Unit 1	05000 498	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 4
		97	-- 012 --	00	

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

DESCRIPTION OF EVENT:

On November 10, 1997, Unit 1 was in Mode 1 at 100% power. At approximately 1701 hours, an Overspeed Protection Control solenoid for the Unit 1 Main Turbine momentarily energized. Approximately eight seconds later, an automatic Reactor trip occurred on two of four Over Temperature/Delta Temperature signals to the Solid State Protection System. A Main Turbine trip followed the Reactor trip. All control rods fully inserted. The Engineered Safeguards Features System actuated the Auxiliary Feedwater System and Feedwater Isolation as expected for a reactor trip. All safety equipment operated as designed for a normal reactor trip.

The momentary energization of the Overspeed Protection Control solenoid caused the Main Turbine governor valves and intercept valves to close. When the Overspeed Protection Control solenoid deenergized, the Main Turbine governor valves opened but the intercept valves remained closed due to their slower acting design characteristic. Within less than a second, the Overspeed Protection Control solenoid re-energized and deenergized again and cycled the governor valves closed and opened. The intercept valves remained closed. This condition caused an increasing pressure in the Moisture Separator Reheaters resulting in lifting the Moisture Separator Reheater relief valves.

The opening and closing of the Main Turbine governor valves resulted in a secondary transient and caused the Steam Generator levels to oscillate. The oscillating Steam Generator levels resulted in main feedwater flow oscillation and deviations between steam flow and feedwater flow. The secondary system transient was reflected in the primary system as an increase in average Reactor Coolant System temperature. Control rods automatically stepped into the reactor core as designed to compensate for the increased Reactor Coolant System temperature. Approximately eight seconds after the initial Overspeed Protection Control solenoid energized, two Over Temperature/Delta Temperature signals actuated in the Solid State Protection System and caused a Reactor trip. The Reactor trip resulted in a Main Turbine trip as designed.

In general, the plant responded to the Reactor trip as expected. During the response to the Reactor trip, the Engineered Safeguards Features System actuated the Auxiliary Feedwater System during the transition from the Tave Mode to the Steam Pressure Mode of the Main Steam Dump system when Steam Generator levels momentarily dropped below the LOW-LOW level setpoint. This transition of Main Steam Dump system operating modes was complicated due to the fact that the Main Steam System drains did not function as designed due to a pressure transmitter failure. This condition resulted in a significant increase in demand on the Main Steam Dump system over what is normally experienced during recovery from a reactor trip.

An evaluation of the Unit 1 Main Turbine Overspeed Protection Control circuit found a failed solid state relay. Further evaluation noted that Westinghouse vendor publication, Data Link No. 9, issued on November 1, 1976 identified the possibility of solid state relay failure in the Main Turbine Protection system. Westinghouse recommended the replacement of the solid state relays with mercury-wetted relays. Investigation found that the Unit 1 Main Turbine Protection system included the solid state relays in parallel with the mercury-wetted relays. Investigation indicates the Westinghouse vendor publication was not transmitted to the South Texas Project due to the affected equipment not on site and the project being under construction in 1976. The

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

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South Texas, Unit 1	05000 498	97	-- 012	-- 00	3 OF 4

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

DESCRIPTION OF EVENT (CONTINUED):

recommendations of the Westinghouse vendor publication regarding the replacement of the solid state relay apparently were not fully implemented prior to arrival and installation of the equipment on site. Present South Texas Project programs, such as the Vendor Equipment Technical Information Program (VETIP) and the Industry Events Analysis program, help ensure vendor information is evaluated for applicability to the South Texas Project design. Eleven additional solid state relays of the same type as the failed relay were found in the Unit 1 Main Turbine control circuitry and were determined to perform a redundant function. The solid state relays were also determined to be in Unit 2 Main Turbine control circuitry and were subsequently removed.

CAUSE OF EVENT:

The cause of the Reactor trip was the momentary energization of the Overspeed Protection Control solenoid due to failure of a solid state relay in the control circuitry. This condition caused the secondary and primary plant transients that resulted in Over Temperature/Delta Temperature circuitry exceeding trip setpoints.

The cause of the Auxiliary Feedwater actuation by the Engineered Safeguards Features System was a pressure transmitter failure affecting Main Steam System drain operation.

ANALYSIS OF EVENT:

Reactor trips and Engineered Safeguards Features Actuations are reportable pursuant to 10CFR50.73(a)(2)(iv). The reactor was brought to an orderly shutdown. All Engineered Safeguards Features functioned as designed. There were no adverse safety or radiological consequences from this event.

CORRECTIVE ACTION:

1. The failed solid state relay in the Overspeed Protection Control circuitry for the Unit 1 Main Turbine was removed.
2. The additional eleven solid state relays found in the Unit 1 Main Turbine control circuitry were removed.
3. The Unit 1 Main Turbine Protection System was tested satisfactorily following the solid state relay removal.
4. The solid state relays in the Unit 2 Main Turbine control circuitry have also been removed and the Main Turbine Protection System has been tested satisfactorily.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)	PAGE (3)
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		ORIGINAL NUMBER REVISION NUMBER 97 -- 012 -- 00	

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

CORRECTIVE ACTION (CONTINUED):

5. The pressure transmitter affecting Main Steam System drain operation was repaired.
6. The Operations Curriculum Review Committee will review this event by March 1998 for potential inclusion of training on operation of the Main Steam Dump control system.

ADDITIONAL INFORMATION:

South Texas Project is reviewing opportunities to improve the reliability of the Main Turbine control system. South Texas Project plans to evaluate the Main Turbine technical manuals to validate that these manuals reflect field installation. In addition, an initiative is being developed for an independent assessment of the Main Turbine control system design.

An industry review was conducted. Although events were found where Main Turbine Overspeed Protection Control circuitry failures led to reactor trips, it was not conclusive that these events were due to the cause stated in this report.

There have been no similar events reported by the South Texas Project to the Nuclear Regulatory Commission within the last three years.